

IN THE DRAWINGS

The attached sheet of drawings includes changes to Fig. 9. This sheet, which includes Figs. 6 and 9, replaces the original sheet including Figs. 6 and 9.

Attachment: Replacement Sheet

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 11-20 are pending in the present application, Claims 11-20 having been amended, and Claim 20 having been withdrawn. Support for the present amendment is believed to be self-evident from the originally filed specification. Applicant respectfully submits that no new matter is added.

In the outstanding Office Action, the specification was objected to under 35 U.S.C. §112, first paragraph; Claims 11-19 were rejected under 35 U.S.C. §112, second paragraph; Claims 11-19 were rejected under 35 U.S.C. §103(a) as unpatentable over JP 53-86634 (hereinafter JP ‘634); and Claim 19 was rejected under 35 U.S.C. §103(a) as unpatentable under 35 U.S.C. §103(a) as unpatentable over JP ‘634 in view of JP 63-33160 (hereinafter JP ‘160).

Applicant respectfully traverses the rejection of under 35 U.S.C. §112, first paragraph. Paragraph 2 of the Office Action states “figures 5 and 9 do not apply any electromagnetic stirring step.” This is incorrect. Page 9, lines 15-19, of the specification states, with respect to figures 5 and 9,

[t]he solid lines represent active convection zones, and therefore circulation zones subjected to the action of the travelling magnetic fields. The broken lines represent the passive convention zones, in other words recirculation zones which are necessarily complementary to the active zones in order to close the loop of the movements.

Page 11, lines 2-3, of the specification also states “the metal streams that form these branches are created by travelling magnetic fields.”

Thus, the specification describes electromagnetic stirring, with respect to Applicant’s figures 5 and 9.

Furthermore, the flow patterns in figures 5 and 9 are different because arrows 20a and 20b in figure 9 point in different directions than the arrows 10a and 10b in figure 5.

Thus, the objection to the specification under 35 U.S.C. §112, first paragraph, should be withdrawn.

With respect to the rejection of Claims 11-19 under 35 U.S.C. §112, second paragraph, the present claims are amended to more clearly describe and distinctly claim the subject matter regarded as the invention. The informalities noted in the Office Action are corrected.

With respect to the discussion of Claim 13 in paragraph 3 of the Office Action, Fig. 9 is amended to show the inductors, which are denoted by the bold arrows that are added to Fig. 9 near point P.

With respect to the discussion of Claim 15 in paragraph 3 of the Office Action, support for Claim 15 is found, for example, in paragraph [0031] of the pre-grant publication of the present application (2007/0074845).

Thus, the rejection under 35 U.S.C. §112, second paragraph, is overcome.

The specification is also amended to correct a minor informality.

Turning to the rejections based on art, it is noted that MPEP §706.02 II is relevant to rejections based on a foreign language document, which is relevant since JP '634 and JP '160 are in Japanese.

This MPEP section makes it clear that if the Examiner is relying on a reference that is not in English, a translation of this document is to be obtained and supplied prior to implementing a final Action. This MPEP section states:

If the document is in a language other than English and the examiner seeks to rely on that document, a translation must be obtained so that the record is clear as to the precise facts the examiner is relying upon in support of the rejection.

Therefore, Applicants respectfully submit that *the Office Action does not provide a prima facie rejection of the pending claims based on the foreign language cited reference.*

To the extent that any subsequent Action relies on JP '634 and JP '160, a copy of the full translations must be supplied as required under MPEP §706.02 II. *See also Ex Parte Gavin, 62 USPQ2d 1680, where the Board of Patent Appeals and Interferences placed the burden of obtaining a translation on the Examiner.*

Applicant respectfully submits that the rejection of Claim 11 as unpatentable over JP '634 is overcome by the present amendment. Amended Claim 11 recites, *inter alia*,

causing liquid metal exchange within the liquid metal between the secondary cooling zone and the mold by utilizing traveling magnetic fields generated by multiphase inductors placed in front of the broad faces of the mold that cause a metal flow in a longitudinal direction of the mold in the secondary cooling zone, the metal flow being localized in a middle region of the liquid metal as two opposing collinear streams, and that cause circulation of the liquid metal **as a single four-leaf clover configuration design having two upper lobes and two lower lobes,**

wherein said two upper lobes and two lower lobes extend from the middle region to the narrow faces of the mold, and the upper lobes extend into the mold right up to a level of jets coming out from the lateral discharge outlets of the submerged casting nozzle.

JP '634 does not disclose or suggest every element of amended Claim 11.

Claim 11 is amended to clarify that there is a **single four-leaf clover configuration** with its lobes extending from the middle region of the mold to the narrow faces of the mold

The method defined by amended claim 11 is concerned with electromagnetic stirring in a continuous casting of a metal product. Travelling magnetic fields (generated by multiphase inductors placed near the liquid metal in front of the broad faces of the mold) are used **to promote a metal matter exchange** (molten metal and also crystallites present therein) in the liquid metal **between the secondary cooling zone and the mold**, by forcibly

establishing a longitudinal metal flow in the secondary cooling zone. The metal flow is canalized in a middle region of the liquid metal as two opposing collinear streams following the longitudinal direction. Circulation of the liquid metal is provided as a single four-leaf clover configuration design having two upper lobes and two lower lobes.

It is to be appreciated that the lobes extend from the middle region to the narrow faces of the mold and the upper lobes extend its effects right up to a level of jets coming out from the discharge outlets of the submerged casting nozzle.

Hence, in the invention defined by Claim 11, electromagnetic stirring is performed in such a way as to create a circulation of the liquid in a single four-leaf clover configuration (with two bottom lobes and two upper lobes).

On the contrary, JP '634 concerns multiple four leaf loops along the width of the mold and which are consequently not able to perform a metal matter exchange within the liquid metal between the secondary cooling zone and the mold.

The method of Claim 11 provides an overall stirring of the metal over the metallurgical length capable of ensuring both thermal and chemical uniformity between the top and bottom of the liquid metal without being deprived of the beneficial effects specific to stirring in the mold and to stirring in the secondary cooling zone respectively, and without disturbing, indeed by stabilizing, the desired local flow in the mold.

Such stirring operation is not described and nor suggested by JP '634, and actually the latter does not permit to achieve the stirring according to the invention defined by Claim 11.

The method of JP '634 uses permanent magnets on the large faces of the mold (ref. 4 on fig. 4 of JP '634) interacting with electrical current circulating longitudinally in the metal product 2 (which is due to up-contacts 6, 7 and down contacts 8, 9). There are no travelling magnetic fields in JP '634 as is described in Claim 11. Furthermore, the method of JP '634 employs a plurality of static magnetic fields across the width of the cast metal product.

The use of a plurality of static magnetic fields in Fig. 5 of JP ‘634 leads to a plurality of local loop flow circuits. The result of such a stirring mode is a plurality of small localized circular streams within the secondary zone, comparable to a sort of localized “bubbling.” This does not result in an overall stirring of the metal comparable to that achieved by the invention defined by Claim 11.

By contrast, the invention defined by Claim 11 uses the electromagnetic stirring to create a single four-leaf clover configuration design having two upper lobes and two lower lobes that extend from the middle region. By doing this, an overall flow system is created in the secondary cooling zone consisting of four lobes, the core of which equates to the “stirring cross” 9 with its center P as discussed in the present specification.

Indeed, this “stirring cross” in the secondary zone leads to the development of a recirculation flows in the liquid metal in the form of single four-leaf clover configuration, and creates a global configuration of the movements of the molten metal that also gets to the mold area.

In view of the above-noted distinctions, Applicant respectfully submits that Claim 11 (and any claims dependent thereon) patentably distinguish over JP ‘634.

JP ‘160 has been considered, but does not cure the above-noted deficiencies in JP ‘634.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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